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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/591,580

09/05/2006

Takuo Watanabe

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MORRISON & FOERSTER LLP
1650 TYSONS BOULEVARD
SUITE 400
MCLEAN, VA 22102

EXAMINER

JACKSON, MONIQUE R

ART UNIT

PAPER NUMBER

1794

MAIL DATE

DELIVERY MODE

09/17/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/591,580	Applicant(s) WATANABE ET AL.	
	Examiner Monique R. Jackson	Art Unit 1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 June 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-6 and 9-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-6 and 9-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The amendment filed 6/9/08 has been entered. Claims 2, 7-8 and 17 have been canceled. Claims 1, 3-6 and 9-16 are pending in the application.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 3-6 and 9-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. As discussed in the prior office action, Watanabe et al teaches a double-sided metal/polyimide laminate comprising a low thermal expansion polyimide, a high thermal expansion polyimide, and a conductor such as copper wherein the low thermal expansion polyimide has a coefficient of linear expansion of $(0-19) \times 10^{-6}/K$ and are formed from dianhydrides and diamines, and mixtures thereof, that that read upon those claimed, and would result in glass transition temperatures as claimed, and wherein the high thermal expansion polyimide has a higher thermal expansion than the low thermal polyimide, preferably $5 \times 10^{-6}/K$ or more, or preferably $10 \times 10^{-6}/K$ or more than the low thermal expansion coefficient (Abstract; Col. 2-4; Col. 6, lines 37-43; Examples.) The high thermal expansion polyimide resin has no restrictions other than being higher than that of the polyimide resin of the low thermal expansion, but it is preferably $20 \times 10^{-6}/K$ or more, and preferably has a glass transition temperature of less than $350^{\circ}C$ (Col. 3, lines 56-68.) Watanabe also teaches that the laminate can be formed by a process as instantly claimed wherein the precursors solutions are sequentially or simultaneously

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applied to a metal foil, such as a copper foil, and then subjected to heat treatment (Col. 6, Examples.) Watanabe et al teach that the polyimide resins differing in linear expansion coefficient are put together to form a composite insulator wherein the thickness of the high thermal expansion (t1) and the thickness of the low thermal expansion (t2) are desirably controlled so as to obtain a ratio of 0.01 to 20,000, preferably 2 to 100, or more preferably 3 to 25 (Col. 5, lines 43-55.) Watanabe et al further teach that the precursor solution may also comprise epoxy resins (Col. 5.) Watanabe et al teach that various layer arrangements can be produced from the conductor, high thermal expansion layer and low thermal expansion layer wherein the arrangement can comprise conductor, low CTE layer, high CTE, in this order to reduce warping; or the arrangement can further comprise an additional high CTE layer, or an additional low CTE layer, or a second low CTE layer having a thermal expansion higher than the first low thermal expansion layer, wherein Watanabe et al teach that variation of the kind and arrangement of the polyimide resin layers of high and low CTE permits easy control of the mechanical properties of the films such as modulus and strength, as well as warping, in answer to various needs (Col. 6, lines 6-36.) Hence, one having ordinary skill in the art at the time of the invention would have been motivated to utilize routine experimentation to determine the optimum number of polyimide resin layers and desired Tg and CTE of each to provide in the laminate based upon the desired end use and mechanical properties as taught by Watanabe et al, to arrive at the instantly claimed structure, given the reasonable expectation of success. Further, Watanabe et al teach that single side or double sided laminate can be produced wherein the laminate can be formed by laminating two base materials, resin to resin, under heat and pressure or by placing a conductor on the resin side of the base material and hot-pressing (Col. 6-Col. 7,

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lines 13-17.) Therefore, one having ordinary skill in the art at the time of the invention would have been motivated to utilize hot-pressing or direct coating, or a combination of the two in order to produce the metal-clad polyimide laminate taught by Watanabe et al.

4. Claims 1, 3-6 and 9-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Takahashi et al (USPN 6,346,298) in view of Watanabe et al. As discussed previously, Takahashi et al teach a flexible board comprises metal foil 1, such as a copper foil, and provided thereon a laminated polyimide-based resin layer 2 of a three-layer structure comprising a first polyimide-based resin layer 2a, a second polyimide-based resin layer 2b, and a third polyimide-based resin layer 2c, wherein the following equation is satisfied: $k_1 > k_3 > k_2$; where k_1 is the coefficient of linear thermal expansion of the first polyimide-based resin layer 2a on the side of the metal foil 1, k_2 is the coefficient of linear thermal expansion of the second polyimide-based resin layer 2b, and k_3 is the coefficient of linear thermal expansion of the third polyimide-based resin layer 2 (Abstract; Col. 6, lines 36-42.) Takahashi et al teach that the k_1 is preferably $20 \times 10^{-6}/K$ or higher (reads upon the claimed “second low” or the claimed “high”; k_2 is preferably $(10 \text{ to } 25) \times 10^{-6}/K$; and k_3 is such that the difference between $k_1 - k_2$ may be confined preferably to $5 \times 10^{-6}/K$, more preferably $3 \times 10^{-6}/K$; wherein the layer thickness are such that they have a thickness ratio that would fall within 0.01-100 (Col. 3-6.) Takahashi et al further teach that the polyimide resin can be produced from diamine and dianhydrides as instantly claimed and would inherently have glass transition temperatures as claimed (Col. 3-4.) Takahashi et al also teach that an epoxy resin may be added to the first, second and their polyimide resins (Col. 6, lines 30-35.) Though Takahashi et al do not specifically teach the claimed glass transition relationship of the layers, one having ordinary skill in the art at the time of invention would have

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recognized that Tg and CTE are related in that as Tg increases, CTE decreases. Hence, one having ordinary skill in the art at the time of the invention would have been motivated to utilize routine experimentation to determine the optimum number of polyimide resin layers and desired Tg and CTE of each to provide in the laminate taught by Takahashi et al based upon the desired end use, to arrive at the instantly claimed structure, given the reasonable expectation of success. Further, it would have been obvious to one having ordinary skill in the art at the time of the invention to produce the laminate by successive coating of the layers or hot-press laminating or any combination of the two in producing the laminate taught by Takahashi et al.

Response to Arguments

5. Applicant's arguments with respect to claims 1, 3-6 and 9-16 have been considered but are moot in view of the new ground(s) of rejection.

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monique R. Jackson whose telephone number is 571-272-1508.

The examiner can normally be reached on Mondays-Thursdays, 10:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on 571-272-3186. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Monique R Jackson/
Primary Examiner, Art Unit 1794
September 15, 2008